IN4MA Metron-p

Pulse counting GSM/GPRS Telemetry Solution

Technical Manual and Specification

Revision 0.99p-b

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METRON FIRMWARE REVISION HISTORY

Version	Date	Comments
0.99	13/07/2007	Metron P introduced to Metron range

This version of the Metron has a plug in board fitted into the D type connector on the front of the main circuit board. This additional board incorporates the real time clock with a battery backup. When the main battery is connected the real time clock draws it power from this, but when power is removed the small on board battery takes over and this has a life of 4 years.

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WARNINGS

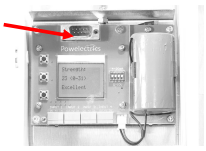
Safety

Read carefully these instructions and notes before powering IN4MA Metron. For each situation please follow the specific instructions.

The Metron is a low power radio transmitter and receiver. When it is powered, it will send and receive radio frequency (RF) signals.

Operating the Metron close to other electrical equipment such as television, phone, radios and personal computer, may cause interference.

DO NOT CONNECT ANYTHING TO THE 9 PIN D TYPE CONNECTOR ON THE FRONT OF THE BOARD WITHOUT PRIOR APPROVAL FROM POWELECTRICS LIMITED.



Interference

The Metron, like all wireless devices, is subject to interferences that may reduce its performance.

Road Safety

Do not use the Metron while driving. In case of use on cars, it is necessary to check that electronic equipment is shielded against RF signal. Do not place the Metron over the air bag or in the air bag deployment area.

Hospital Safety

Do not use the Metron near health equipment, especially pacemaker and hearing aids, to avoid potential interferences. The Metron is a not mobile phone; do not use it in direct contact with the human body. Switch it off in hospitals, and in any other type of medical centre. Hospitals or health care facilities may be using equipment that could be sensitive to external RF energy.

Explosive Materials

Do not use the Metron in refueling points, near fuel or chemicals. Do not use the Metron where blasting is in progress. Observe restrictions, and follow any regulation or instruction.

Do not use the Metron in direct contact with the human body; do not touch the antenna if not necessary when the Metron is powered. Use approved accessories and batteries only. Do not connect incompatible products.

Battery Information and safety

- Do not use if the battery casing appears damaged
- Do not attempt to recharge the battery
- Do not short circuit
- Only use supplied battery with the IN4MA Metron

The battery is a high energy density sealed battery containing dangerous (Lithium) and deleterious (Thionyl Chloride) materials. For this reason, improper handling of the battery could lead to distortion, leakage, overheating, explosion, fire, or generation of irritating/corrosive gases, causing bodily injury or equipment trouble. Please observe the following instructions to prevent accidents.

Do not use if you suspect any damage to the casing, cabling or connector.

Do not connect to a Metron when the programmer is connected.

Be careful not to drop – if dropped please do not use.

Do not short circuit the battery – if you suspect this possible then disconnect and do not use.

Do not apply heat to the battery.

Do not expose the battery to open flames.

Never disassemble the battery.

Never deform the battery.

Do not reverse polarity the battery – take extra care to ensure connections are the right way round.

Do not connect 2 or more batteries together.

Do not store the batteries in direct sunlight.

Store batteries in non conductive trays (e.g. plastic, wood or cardboard).

Do not use near water.

Do not have rings on your fingers when handling batteries, otherwise wear insulating gloves.

First aid measures:

Only in case of contact with internal components of the battery:
Skin contact: flush with plenty of water
Eye contact: flush with plenty of water (eyelids held open)
Inhalation: breath fresh air and give oxygen or artificial respiration by specialist people
Ingestion: drink much water and consult a doctor

Fire fighting measures:

Evacuate the building and leave it to the professionals. Advise the fire fighters that there are batteries in the building and the advice is to use extinguishers type D, Lith-X, DO NOT USE WATER in case of battery leakage
Special hazards: irritating vapour

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Special protective equipment: wear protective clothing, use self-contained breathing apparatus with filtered cartridge type ABEK

Leakage measures

In case of break of a battery, all the people must go away from the place where the incident happened and come back only after the dissolution of the irritating gas.
Broken batteries or battery packs must be covered with sodium carbonate (Na2CO3) or dry sand, place them in approved container and dispose in accordance with local regulation.

Disposal

Please return batteries to Powelectrics for disposal. Ensure suitable packaging in used. Do not use air freight.

Replacing the Battery

The battery used in the Metron must be supplied by Powelectrics Ltd. Its warranty will be void if any other battery is used as it may damage the Metron or cause it to malfunction.

To remove the battery, simply remove the plug from the PWR socket – Do not pull on the connecting wires. The battery can now be easily pulled from the retaining clip. Push the new battery into the retaining clip centrally, and then reconnect the plug to the socket on the Metron board.

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OVERVIEW

This document describes all the functions, features and interfaces of the IN4MA Metron telemetry device.

Applications

A few of the applications that this device has been designed for include:

- Remote meter reading
- Remote people counting

Summary of Technical Features

- Ability to interface with up to four pulse signals
- On-board wetting voltage
- Typically > 2 year battery life **(check)**
- LCD Display to help with on-site setup
- Tri-band operation

As the Metron is a battery powered device it has been designed in such a way to extend this life to a maximum. This means during normal operation the display will be off, the sensors excitation will be off and the GSM engine will be powered down. As required these are switched on by the processor and when finished with they are switched off.

GENERAL DECRIPTION OF OPERATION

Normally the unit will be 'asleep' with just the processor running, providing a wetting voltage of 3.6 volts. When the Metron needs to communicate over the mobile phone network it will power up the GSM module (this takes a minute or 2 as the module needs to register onto the network – it's like switching on your mobile phone). Whilst the modem is powered it can receive messages for changing the configuration. The LCD screen shows the actions the Metron is performing.

The Metron will send text messages to your mobile phone, or Gateway (our internet based reporting and alarm handling solution). The Metron can send messages periodically.

NAVIGATION BASICS

A common method is used throughout the menu system for navigation.

To move up within a menu – You must use the top button to the left of the screen (*UP*) to move up if you are navigating in a menu.

To move down within a menu – You must use the bottom button to the left of the screen (*DOWN*) to move down if you are navigating within a menu.

To select an item on a menu – You must press the central button to the left of the screen (*ENTER*) for less than one second to select an item if you are within a menu.

To go to the previous menu – You must press the central button to the left of the screen for more than one second to return to the previous menu. You should continue to hold until the previous menu appears.

To return to the previous menu when displaying information – If the Metron is just displaying information, you can return to the previous menu by simply pressing the central button to the left of the screen briefly.

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GETTING STARTED

1. Open the packaging	Cut the seals from the box and open the cardboard lid
2. Remove the lid	Using a large Phillips screwdriver, remove the four screws fastening the plastic lid to the enclosure and remove the lid
3. Fit the SIM card	Remove the four outer screws from the circuit board and tilt the circuit board 90 degrees to the right
	Carefully remove the antenna cable from the circuit board – do not use excessive force.
	Slide the SIM card into the SIM card holder. The final position is drawn onto the circuit board.
	Re-attach the antenna cable and fasten the circuit board using the four outer screws.
4. Power up the unit	Visually inspect the battery and cable condition to ensure no damage. If in doubt do not use. Place the battery into the clip and connect the power connector.
5. Program the unit	The Metron can only be programmed by sending text messages.
	The Metron config is not compatible with this version of the Metron.
	You can only send one command at a time.
	Each command must be sent via text message to the correct number for the Metron.
	Please go to the Programming Specification section to define the text messages you want to send to the Metron and send from your mobile phone.
	On the Metron - Press the (ENTER) button to 'wake up' the Metron, go to 'System' and then go to 'Get Config'. The display should read 'Waiting for Messages..' after it has established You must wait until each of the text messages sent has been received and successfully interpreted – It will display 'Success' or 'Invalid Command' in each case.
	When all the messages have been received, press and hold the central button until you are returned to the main menu. If you leave the unit unattended for 20 minutes it will go into sleep mode.

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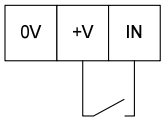
6. Connect inputs & test For each input that you have programmed, connect the required sensor and navigate to the relevant input settings. Choose the 'Read Now' option to see a real time scaled reading from the sensor.

Volt free contact connections



ENSURE THE DIP SWITCHES ARE ALL SET TO 0-10V

7. Put the Metron to sleep Return to the main menu then press and hold the central button until it displays 'Sleeping..'. The Metron will now be operational.

CONNECTIONS

Serial Port

Into here is fitted a plug in board which contains the real time clock

PWR

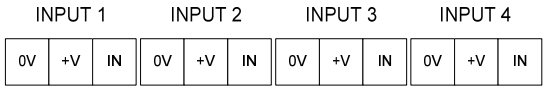
This socket should only be used for connecting the battery to the board. It is polarised – It should be impossible to connect the power incorrectly. Ensure that a secure connection is made. When you remove the connector, do not pull using the wires as this may impair the electrical connection.

DIL Switch

Each of the 4 (labelled 1, 2, 3 and 4) switches in this bank should be set according to the type of sensor used on the appropriate channel, either 4-20mA or 0-10V. The bottom position is 0-10V, while the top position is 4-20mA. If there is no sensor connected, it does not matter which position the corresponding switch is set to. **For this version of the Metron the dip switches must be set to 0-10V.**

INPUT 1, 2, 3 and 4

Each sensor or connected input has its own plug and corresponding socket. On each socket, three connections are available.



0V

This is the 0V / -Ve connection for the channel, although they are all common to each other.

+V

This will provide the supply voltage to the channel. This is configurable to either 21V or 3.6V. It is important that the load on this does not exceed the specifications.

IN

This is the input for the channel – This will accept 0-10V

Note: It is important that the channel used for the sensor excitation and the sensor inputs are the same. The connection to ground is not channel dependant.

PUSHBUTTONS

These are used in conjunction with the display in order to access and navigate the menu system.

INSTALLATION

The Metron comes pre-assembled with the appropriate battery fitted, but not connected.

To achieve optimum performance from the unit, it is advised that the following guidelines are followed during the installation:

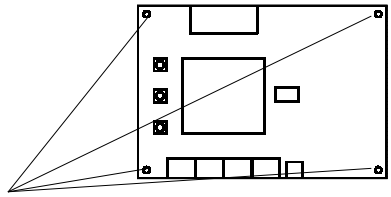
- To achieve optimum signal strength, the Metron must be mounted upright, with the label reading the correct way up
- Large metal objects that are in the transmission path of the Metron may hinder the performance
- Check that the glands are tightened and any blanking plugs are fitted tightly. The inside of the unit must remain dry, as water ingress may damage the Metron.

ANTENNA

The Metron comes with an antenna attached. The system has been designed to gain optimum signal strength to the mobile phone network but it is possible to use an external antenna. The Metron presents an SMA type connector for the antenna and the cable can be connected into the enclosure via one of the glands.

SIM CARD

The SIM card holder is located beneath the circuit board and can only be accessed by removing the circuit board. The circuit board is removed by unscrewing the 4 outer Alan screws. These screws need to be removed in order to gain access to the SIM card holder. When removing the circuit board, remove the antenna cable carefully with a firm grip.



Check with your GSM provider if your SIM is enabled for data and fax traffic, if not ask them for this service, they will give you other two numbers (one for data calls and the other for fax calls). If you are using 'pay as you go' ensure that you have credit on your SIM, and that you do not have a minimum usage to maintain operation.

Menu Item	Function
Unit Info	Displays the Unit Name and the Firmware Version. The firmware version may be requested if you contact Powelectrics for support.
Transmit time	What time each day the unit will transmit data.
Diagnose	A self diagnostic function that allows the user to determine if there are any problems and where they may lie. For each of the checks, it will return 'Pass' or 'Fail'. SIM: This checks to see if the SIM card is present and if the SIM card has PIN protection. REG: This checks for correct network registration. If it is on the home network or on a roaming network and is connected correctly, it will return 'Pass'. SIG: This checks the signal strength and returns 'Pass' if the signal is strong enough for the Metron to operate reliably. IMEI #: The IMEI number is displayed for your reference.
Check Signal	This feature logs onto the network and monitors the signal strength. It displays the signal (0 – 31 or 99) and an interpretation of this so you can evaluate if the signal will be adequate or not. No Signal: There is extremely little or no signal available to the Metron. It will be unable to operate in these circumstances. Very Poor: There is a poor signal available to the Metron and the ability to operate successfully may vary according to weather conditions. Marginal: There is a signal available that can generally allow reliable operation of the Metron. Signal OK: The signal is well above operational levels. Excellent: The signal is very good – optimum conditions for successful Metron operation. Note: If you do not have a SIM card present in the Metron, this function will still operate but instead will read the signal strength of the strongest operator signal present.
Get Config	To configure the Metron via text message, you must first put the Metron into configuration mode. By selecting 'Get Config', it will do this and interpret any text messages that are received.
Phone book - SMS	When selecting the SMS Phonebook, it will display the four numbers that are present in the Metron phonebook. If a number has not been programmed, it will show 'No Number' by the corresponding entry.
Input 1, 2, 3, 4	When selecting any of the inputs, it will bring up a sub-menu that directly corresponds to the input that has been selected.
Input Tag	This will display the name that has been given to the input. It will also confirm that the input is enabled.
Scaler	The scaling factor for this pulse input
Reset or Roll over	Tells you if the unit is to reset after it has transmitted data or whether it is to roll over and continue counting
Read Now	The pulse count value for this channel is displayed – this is the 'raw value' before the prescaler is applied. This reading is scaled just before transmission. **(check)**
Set time	Allows you to set the time locally on the unit

CONFIGURATION

The Metron is configured by sending it different text messages. Please refer to the relevant section within this manual.

SPECIFICATION

General:	Number of Channels:	4
	Battery Life:	Typically > 2 Years
	Battery Included:	Yes
	Connectors:	3 Pin 3.81mm Pitch / Sensor
		SMA Antenna Connector
		2.54mm Molex Power Connector
		9 Way D-Type Male (internal use only)
	Warranty:	12 Months RTB
Form Factor:	Enclosure:	IP67 Rated, Polycarbonate
	Dimensions:	180 x 130 x 76 (mm)
	Weight:	~ 0.7 Kg
Electrical:	Operating Frequency:	900/1800/1900Mhz
	Supply:	3.6V @ 0.5A
	Excitation Supply:	~ 3.6V @ < 120mA
	Power consumption (Sleep):	~ 610µA
	Power consumption (Active):	~ 6mA
	Power consumption (Modem):	~ 12 – 250mA
	Input Impedance:	33KΩ (0-10V)
	Max input frequency	10 Hz (minimum 50 millisecond pulse width)
	Maximum cont	4294967295
Environmental:	Temperature:	-15 to +45 ºC
	Humidity:	20 to 80% non-condensing

BATTERY LIFE

The Metron-P draws 0.610mA in sleep mode. Switching on the display, the sensors or the modem increase the current draw and therefore reduces battery life. Each text message takes approximately 0.000875 AH. The battery capacity is 14.5AH.

Typical battery life is 1 year.

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Programming Specification

Important points to note

- Valid characters are **0-9**, **a-z**, **A-Z**, **+**, **-**, _ and **.**
- Spaces are allowed but not recommended (they are ambiguous), use _ instead
- All text messages and names are case insensitive.
- **.** is used as the separator, and is also used to end the command.
- The Metron does not use phone number identification as an authorisation method. The security for the Metron is a single three digit password.

The text message format

The format of a text message to program the Metron is shown below. [and] are not literal characters, they enclose a description of what is expected. There may be more than one parameter, but this is dependant on the command being issued.

```
[password].[command number].[parameter].
```

Every text message sent to the Metron will only be processed if it begins with the correct three digit password. If this is not the case, no action will be taken.
The default password is 'oli'.

The command numbers are as followed.

Command Number	Description
1	This is used to program the phone book
2	This is used to configure the system settings
3	This is used to configure the inputs
4	This is used to change the password
5	This is used to reset the system to factory settings
6	This is used to request the configuration and status

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Command Number 1 – Programming the phone book

Description

This command will set up to four of the phone book entries on the Metron.

Format

```
[password].1.[phonenumber1].[phonenumber2].[phonenumber3].[phonenumber4].
```

Example text message

```
oli.1.+447712345671.+447712345672.+447712345673.+447712345674.
```

Parameters

Parameter	Description	Limitations
Phone number	The phone number of a device to transmit to	The phone numbers can be up to 4 to 14 digits in length, including '+'

Notes

You must include the country code e.g. +44.

If you need to set fewer than four phone book entries, use the same format but omit the desired numbers. For example:

```
oli.1.+447712345671.+447712345672.
```

The numbers are programmed into the phonebook in order

Command Number 2 – Configuration of the system settings

This command will configure the system settings on the Metron.

Format

```
[password].2.[unit name].[transmit time] .[temperature
enabled].[formatting].
```

Example text message

```
oli.2.pump_house.23.0.0.
```

Parameters

Parameter	Description	Limitations
Unit name	A unique name that identifies the particular Metron	This cannot be more than 20 digits in length
Transmit time	The hour at which the Metron will transmit the readings	This must be a whole number between 0 and 23Minutes 0 = midnight, 23 = 11pm
Temperature Enabled	Whether the temperature is transmitted within the text message or not	0 = disabled 1 = enabled
Formatting	This dictates the formatting of the text messages – allows it to be used in conjunction with the Gateway	Must be 0 or 2 0 = Standard 'User' Formatting 2 = Use Gateway (Internal use only)

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Notes: The formatting option is for use exclusively with Powelectrics Gateway. If you select Gateway functionality, only phone number 1 will be used.

Command Number 3 – Configuration of the Inputs

Description

This command will configure the inputs on the Metron

Format

```
[password].3.[input number].[input name].[prescaler].[reset or
rollover].[units].
```

Example text message

```
oli.3.1.level_1.0.litres.
```

Parameters

Parameter	Description	Limitations
Input number	The number of the input that you want to configure	Must be 1, 2, 3 or 4
Input name	A name to identify the input	This cannot be more than 20 digits in length
Prescaler	The number of counted pulses is divided by this value. So if Prescaler = 2, 100 pulses is reported as 50 units.	Must be between 0 and 32767
Reset or Rollover	Once transmitted the Metron can either reset the counter to zero or it can simply continue counting	0 = Reset 1 = Rollover
Units	A word to identify the units of measure	This cannot be more than 10 digits in length **(check)**

Notes

You will need to send a single instance of this command for each input you would like to program (specifying the input number)

Command Number 4 – Changing the password

Description

This command will change the password

Format

```
[password].4.[new password].
```

Example text message

```
oli.4.pow.
```

Parameters

Parameter	Description	Limitations
New password	This is the password that will replace the current password	It cannot be more than 3 digits in length

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Notes

Once you have set this password, the new password will come into effect immediately

Command Number 5 – Clearing the configuration

Description

This command will reset all settings on the Metron, including the system password (returns to the default password)

Format

```
[password].5.
```

Example text message

```
oli.5.
```

There are no parameters

Notes

Powelectrics can remotely reset your Metron if you have forgotten the password. Contact Powelectrics for more information.

Command Number 6 – Requesting Configuration and Status

Description

This command will prompt the Metron upon the next Transmit Interval to send the current configuration and status **to the device that has sent the command** using SMS messaging

Format

```
[password].6.
```

Example text message

```
oli.6.
```

There are no parameters

Notes

It will only respond when the Metron reaches its next Transmit Interval

It will send the SMS message only to the device that sent the command.

Text Message Format

Important points to note

- The Metron does not use phone number identification as an authorisation method. The security for the Metron is a single three digit password.
- The Metron P will send a text message once a day at the pre-programmed time. When the message is sent the Metron P stays awake for 40 seconds so it can recei ve any new commands you have sent it.

How the formats are described.

[and] are not literal characters, they enclose a description of what will be sent, for example:

```
[reading]
```

Description

Every time the transmit time is reached, the Metron will transmit the readings from all of the inputs that are enabled. **If a particular input is not enabled, the name and reading of the input will simply be omitted.**

Formatting Modes

The formatting of the text message is dependant on the formatting mode in the system settings. Only 1 format can be used.

'User' Formatting

```
LOG: [unit name]
[input 1 name]: [reading] [units]
[input 2 name]: [reading] [units]
[input 3 name]: [reading] [units]
[input 4 name]: [reading] [units]
```

'User' Example

```
Metron pulse counter: unit_name
Meter_1_gas: 512345 m3
Meter_2_water: 167789 litres
Meter_3_elec: 75667 kwh
Meter_4_misc: 123 litres
```

Gateway Formatting

```
log,,[input 1 name],[reading]:[input 2 name],[reading]:[input 3
name],[reading]:[input 4 name],[reading]
```

Gateway Example

```
log,,meter_1,50.34:meter_2,23.01:meter_3,45.00:meter_4,64.83:22.125
```


Reset Confirmation text message format

Description

When the unit has been remotely reset, a confirmation will be sent to the number issuing the command

Formatting

```
Reset Successful
```

Notes

If the remote reset has not been successful for any reason, there will not be a confirmation of any kind.